STANDARD AUTONOMOUS FILE SERVER
SAFS

Design and Functional Specifications Document

Version 1.0

January 7, 1998

DRAFT

Prepared by:
Susan K. Semancik/584
Annette M. Conger/CSC

Table of Contents

Appendices

List of Tables

List of Figures

1.0 INTRODUCTION

The purpose of the Standard Autonomous File Server (SAFS) effort is to create an operational system which will provide automated management of large data files which are the result of mission specific data functions. In addition, the SAFS will provide customers access to these files in a timely fashion without interfering with the assets involved in the acquisition and processing of the data. The purpose of this document is to describe the mission requirements, proposed design, functional specifications, and operations concept underlying this effort.

2.0 OVERVIEW

The system overview and basic assumptions have been detailed in the SAFS Project Management Plan. An applicable document list is contained in Appendix B of this document.

The operational concept described here is intentionally broad to allow for the placement of the SAFS system into diverse environments meeting a variety of application needs. Even the use of the term "telemetry processor", while appropriate for our first intended application, QuikSCAT, can more broadly be thought of as any processing system that acquires raw data and provides it to the SAFS in a format for later customer consumption.

3.0 REQUIREMENTS

The following have been determined to be the current high-level requirements of the SAFS:

1) SAFS shall receive data files from the telemetry processor(s) within the ground station.
2) SAFS shall manage the data files transferred from the telemetry processor(s).
3) SAFS shall handle data file dissemination.
4) SAFS shall provide a file transfer verification method.
5) SAFS shall perform file management on the processed files.

3.1 Data Volume

The following chart shows the data volume expected for the missions currently anticipated to be supported:

Table 1 - Data Volume

QuikSCAT					
Type	**Vol/Orbit**	**Pass/Day ***			**Maximum Total Daily Volume**
HK1	3.1MB	14 WPS 14 SGS 14 AGS			43.4MB WPS 43.4MB SGS 43.4MB AGS
HK2	3.1MB				43.4MB WPS 43.4MB SGS 43.4MB AGS
SCI	30.0MB				420.0MB WPS 420.0MB SGS 420.0MB AGS
QuikSCAT TOTAL		**14**			**506.8MB**
* Since the number of passes/site have not yet been determined, we have assumed the worst case per site in order to estimate the daily volume; however the mission total is based on 14 passes/day.					
ADEOS-II					
Type	**Vol/Orbit**	**Pass/Day**	**Mode 1 Daily Volume**	**Mode 2 Daily Volume**	**Maximum Total Daily Volume**
AMSR-L0	84.15MB	2-4 WPS 8-14 ASF		336.6 MB WPS 1178.1 MB ASF	336.6 MB WPS 1178.1 MB ASF
ILAS-II – L0	81.65MB			326.6 MB WPS 1143.1 MB ASF	326.6 MB WPS 1143.1 MB ASF
GLI-1km L1	540.0MB		2160.0 MB WPS 7560.0 MB ASF	2160.0 MB WPS 7560.0 MB ASF	2160.0 MB WPS 7560.0 MB ASF
SeaWinds	26.8MB			107.2 MB WPS 375.2 MB ASF	107.2 MB WPS 375.2 MB ASF
HK	3.1MB			12.4 MB WPS 43.4 MB ASF	12.4 MB WPS 43.4 MB ASF
DCS/real L0	0.9MB		3.6 MB WPS 12.6 MB ASF	3.6 MB WPS 12.6 MB ASF	3.6 MB WPS 12.6 MB ASF
ADEOS-II TOTAL		**14**	**2163.6 MB WPS 7572.6 MB ASF**	**2946.4 MB WPS 10312.4 MB ASF**	**2946.4 MB WPS 10312.4 MB ASF**

To provide for unattended ground sites over holiday weekends, data will be retained on the SAFS systems for a mission-specific minimum number of hours.

3.2 User Community

Latency is the file delivery time to the customer starting from the time of data observation on board the satellite. For the currently defined missions, the following customers and file requirements have been identified:

Table 2 - Customer File Requirements

QuikSCAT				
CUSTOMER		**FILE TYPE**	**FILE SIZE**	**DATA LATENCY**
Space craft (MOC)		PBK HK1	3.1 MB	2.5 hours
JPL (SEAPAC)		PBK HK2	3.1 MB	2.5 hours
		PBK SCI	30.0 MB	2.5 hours
NOAA		PBK HK2	3.1 MB	2.5 hours
		PBK SCI	30.0 MB	2.5 hours
ADEOS-II				
CUSTOMER	**MODE**	**FILE TYPE**	**FILE SIZE**	**DATA LATENCY**
NOAA	1	DCS real L0	0.9 MB	2.5 hours
	1	GLI 1KM	540.0 MB	11.0 hours
	2	DCS real L0	0.9 MB	2.5 hours
	2	GLI 1 KM	540.0 MB	11 hours
	2	SeaWinds	26.8 MB	2.5 hours
EOC	1	DCS real L0	0.9 MB	2.5 hours
	2	DCS real L0	0.9 MB	2.5 hours
	2	AMSR	84.15 MB	1.0 hour
	2	ILAS	81.65 MB	1.0 hour
	2	HK	3.1 MB	?

Meeting the latency times imposed by the customer is dependent on the following:

a) the time it take to acquire the data on orbit
b) the time it takes to down link the data from the satellite
c) the time for the telemetry processor to create files from the raw data
d) the speed of the connection between the telemetry processor and the SAFS
e) the time for SAFS to perform file management and customer notification
f) the delay before the customer initiates a “pull” of the data file
g) the speed of the connection between SAFS and the customer
h) the amount of traffic on the connection to the customer.

SAFS is required to provide data availability notices (DRN) to customers who use standard file transfer methods. File delivered notices (FDN) will be provided to those customers using improved automated file transfer products, referred to here simply as COTS-C products.

3.3 Network Environment

The network environment in which SAFS is placed is a critical component in meeting customer’s latency requirements. The physical network components are not under SAFS’s control, but by encouraging the use of improved transfer protocols, data transfer rates can be improved. Customers may also improve the data transfer process by accepting automated “pushing” of data files. This would eliminate the delay period between the data ready notice and the customers “pulling” of data files.

The following chart lists some of the features offered by different vendors under consideration for their improved transfer COTS-C products:

Table 3 - COTS-C Products Comparison

StarBurst Cyber Caster	StarBurst MFTP	FASTCopy	Checkpoint FTP	Features
•	•	•		Guaranteed file delivery (self-correcting transmissions)
•	•	•	•	Recovery from point of failure
•	•	•		Stop/Resume transmission control
•	•	•		Programmable network bandwidth
• •		• •	•	On-the-fly compression Automatic un-compression
•	•	• •	•	File security: Authentication Data transfer firewall
•	•	•		Multi-platform/cross-platform support
• • • •	•	• • • • •		Application Programming Interface Automated tasks Pre-transfer processing Post-transfer processing Scheduled transfers
•				High speed transmission for multiple destinations
•				Multiple files packaged for single-file transmission
$$$$$$	$$$$	$$		Cost

Preliminary tests for transferring a 30.5 MB mission data file using various bandwidths and protocols are illustrated in the following table (similar test will be performed on imaging data as well):

Table 4 - Time comparison for various protocol file transfers

Protocol	**Data Type**	**Bandwidth**	**Compress**	**Time (secs) ***
FTP	R/T Mission	10.0 Mbps (Ethernet)	N	37
FASTCopy	R/T Mission 30.5 MB binary data	10.0 Mbps (Ethernet)	N	37
		10.0 Mbps (Ethernet)	Y	20
		1.5 Mbps (T1)	N	159
		1.5 Mbps (T1)	Y	24
	JPL tif 30 MB image data	10.0 Mbps (Ethernet)	N	37
		10.0 Mbps (Ethernet)	Y	97
		1.5 Mbps (T1)	N	145
		1.5 Mbps (T1)	Y	156
	Pathfinder 10 MB image data	10.0 Mbps (Ethernet)	N	13
		10.0 Mbps (Ethernet)	Y	19
		1.5 Mbps (T1)	N	54
		1.5 Mbps (T1)	Y	33
StarBurst				TBD
Checkpoint FTP				TBD
*Note: Times are approximate due to circuit utilization and scheduling contingencies at the time of transfer.				

3.4 Target Dates

For QuikSCAT, the following dates have been targeted:

4/98	Data flow test with lab prototype system
6/98	Data flow test with WPS and Central SAFS at GSFC
8/98	End-to-end test with AGS, SGS, WPS and Central SAFS
11/98	Launch

For ADEOS-II, the following dates have been targeted:

2/99	NGN Integration & Testing
8/99	System Integration & Testing
2/00	Launch

4.0 Functional and Operational Description

Figure 1 indicates the SAFS operations concept, showing the ability of the system to receive data from multiple telemetry processors using standard network protocol, and then disseminating these files to multiple customers.

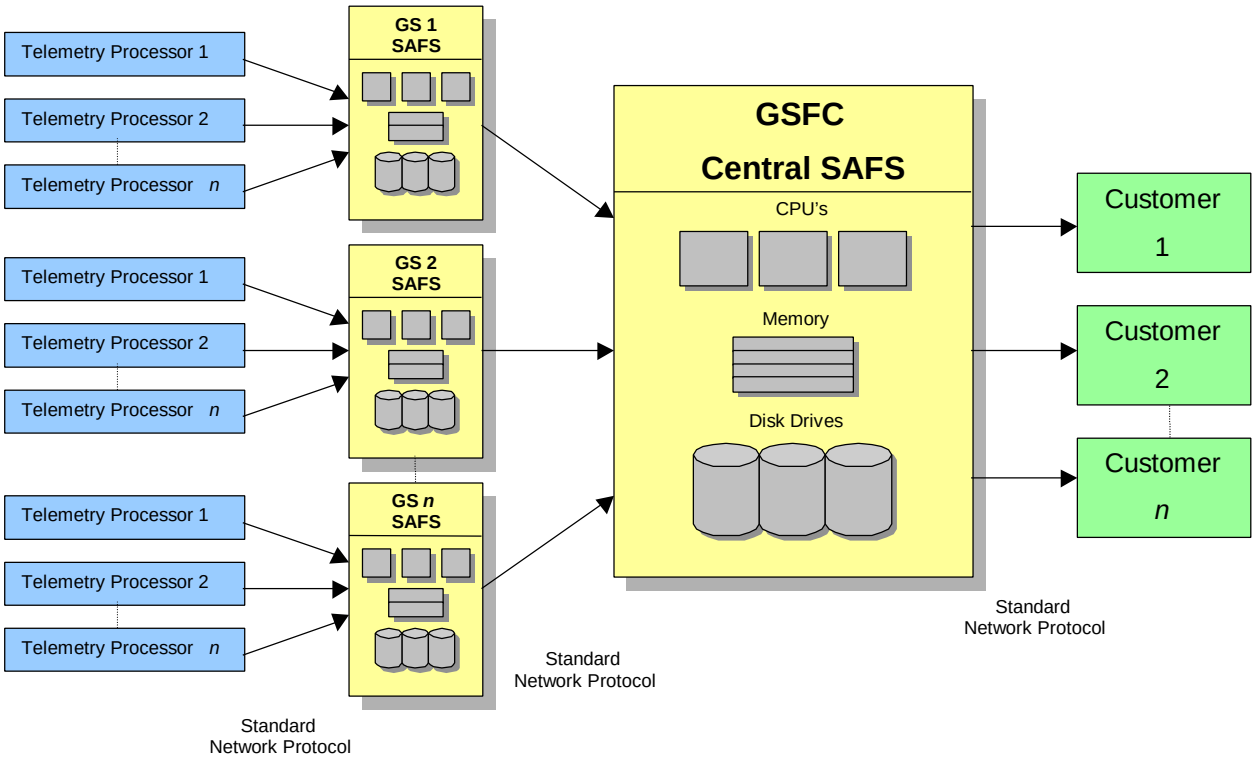

Figure 1- Operational Concept Diagram

The SAFS system itself can be configured differently with respect to the storage and speed requirements of the intended application, as well as the data transfer method required by the customer, as the arrow to the customer in Figure 1 represents either a “push” or a “pull” transfer mechanism

The current network design, as illustrated in Figure 2, will provide a single location, the Central SAFS, where customers can retrieve their data files on an open-network without interfering with the associated resources on the closed-network. This centralized SAFS server can also be used to prioritize the distribution of data to those customers with critical latency requirements. In the event of a single data file needing to be distributed to multiple customers, multicasting file transfers should be considered to provide faster transfers. By distributing the SAFS systems at the ground stations, customers on the closed network can access their data directly without having to go through the firewall to retrieve their data on the Central SAFS. Also, if one SAFS becomes disabled, it will not adversely affect other ground stations’ ability to make data files available to their customers.

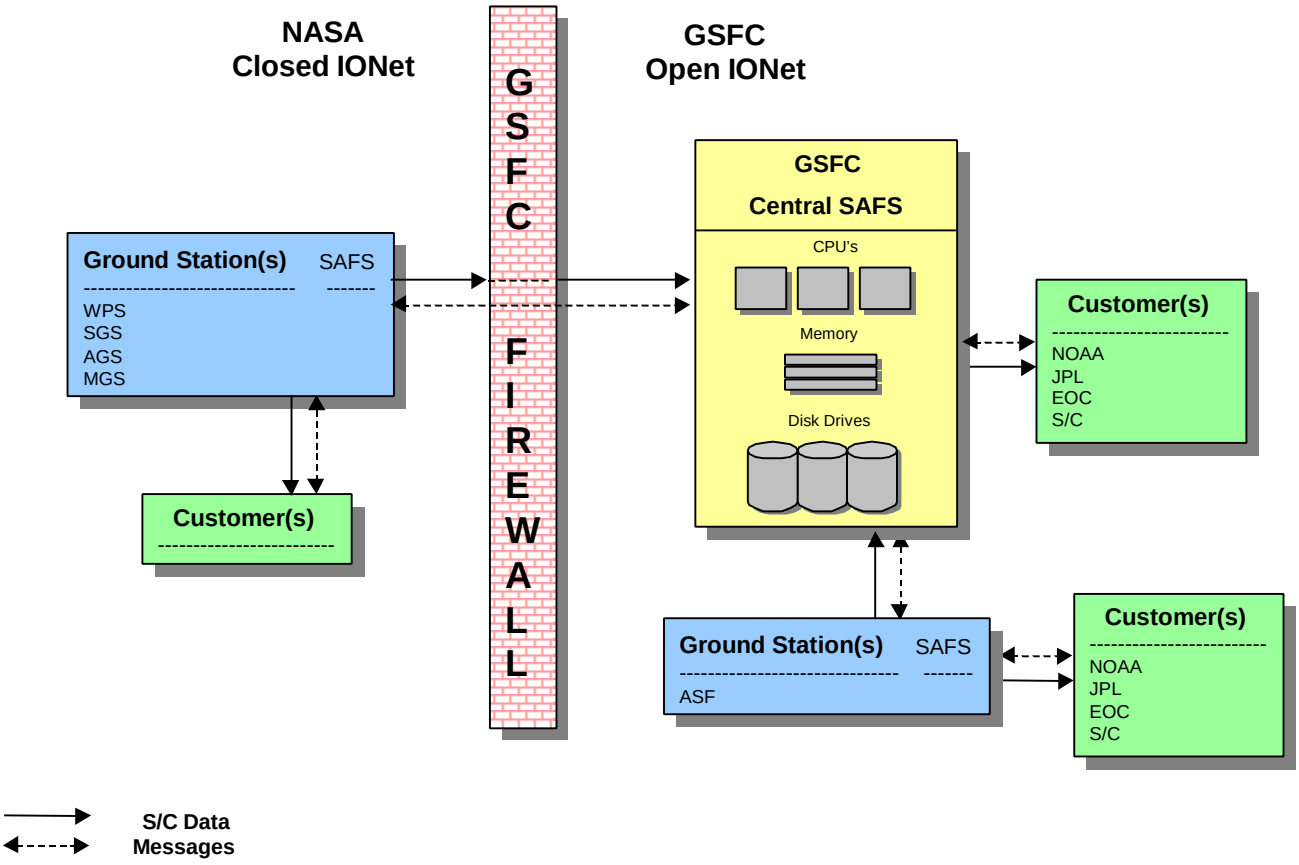

Figure 2 – Network Diagram

The NASA Integrated Services Network (NISN) will be used to provide communications between the ground station SAFS and the supporting telemetry processors. A closed network connection will be used from the Central SAFS at GSFC and the ground station SAFS at AGS, SGS and WPS. The EBnet within the NISN will be used to connect to QuikSCAT customers on the open network who do not have other communication lines to the Central SAFS. The Closed Network Gateway at GSFC will provide a firewall between the closed and open network traffic. Any customers on the closed network or those closer to a ground station can get their data files from either the originating ground station SAFS or the Central SAFS.

Figure 3 is a high-level diagram of the operational aspect of SAFS, showing the input, output, and critical control sequences. Dashed lines indicate error control paths.

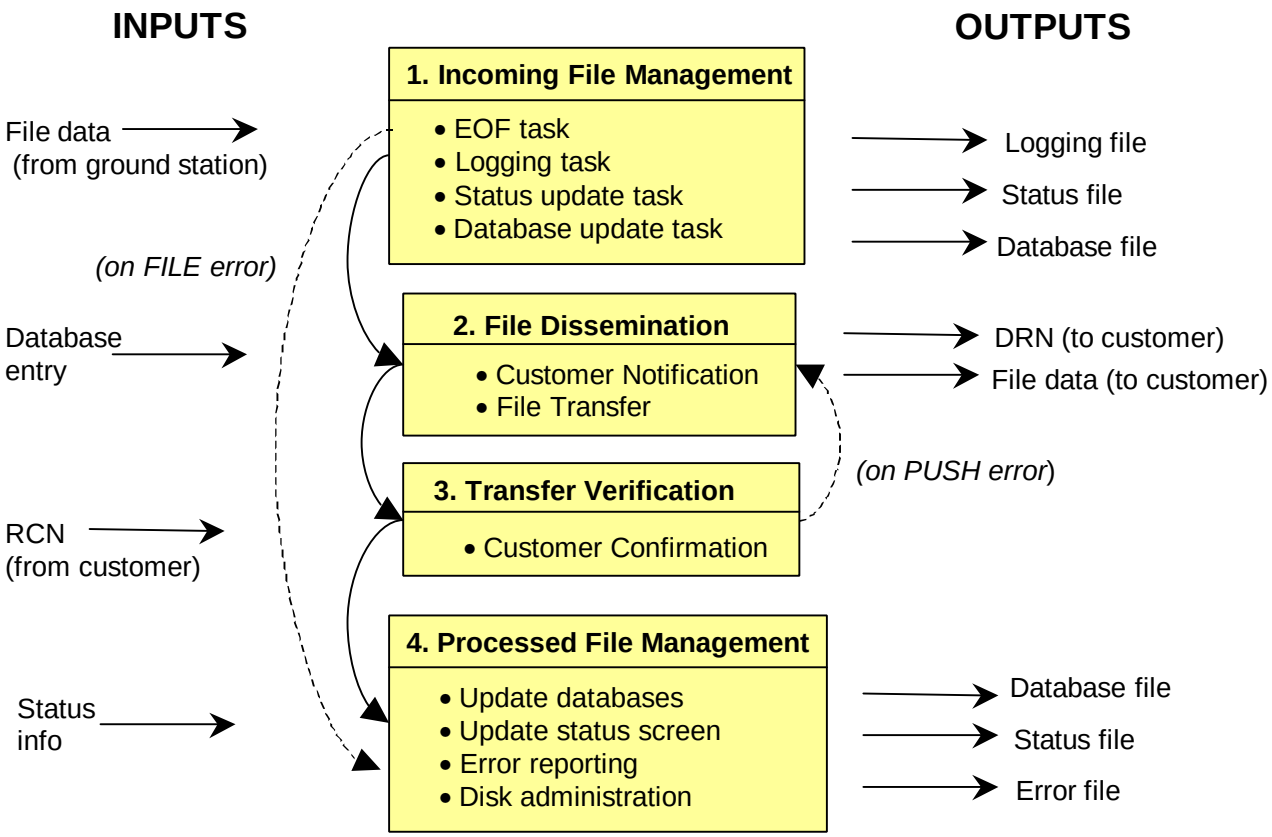

Figure 3 – Functional Specifications

4.1 Data Acquisition

A telemetry processor sends data to the SAFS using either a standard network protocol or a COTS-C product. At the SAFS, the data file is deposited on a disk drive in a mission specific directory from which it is accessible to the customer. The telemetry processor must accomplish the following tasks:

1. Receive and process raw data from the ground station.
2. Store data using pre-determined file naming conventions until processing is complete.
3. Send processed data files to the SAFS.

4.2 Incoming File Management

The SAFS will perform file management on the incoming data files by logging information to appropriate files. It will also update any status information and report appropriate information via a system console and/or a web page. The tasks associated with this function (see box 1 in Figure 3) are as follows:

1. Determine when a file has been received from the telemetry processor.
2. Update logging and status files.
3. Report status and error messages as needed.

Files obeying a pre-defined naming convention will be entered in an in-coming directory on the SAFS, where further processing tasks will be initiated. Files not obeying the naming convention will be processed by an error reporting task (see box 4 in Figure 3). All task activities are logged to a file.

4.3 File Dissemination

The SAFS will check its customer database to determine who to notify about file availability. The SAFS can either "push" the file to the customer or the customer can "pull" the file from the SAFS. The tasks (see box 2 of Figure 3) associated with this function are as follows:

1. Determine each customer database entry requiring file dissemination.
2. Perform customer notification.
3. File is transferred to/by customer.

If more than one customer requires the same file, a priority scheme will be imposed to ensure that the customer with the highest priority receives the file first. This scheme will not be necessary if multicasting FTP is utilized, since all customers will receive the file simultaneously. Customer notification can be done through specially coded mail, called data ready notices (DRN), or can be accomplished through the multicasting FTP polling technique where only responding customers have their files "pushed" to them. With the DRN method, customers will "pull" their files when ready. Customers with "pushed" files will receive file delivered notices (FDN).

4.4 Transfer Verification

The SAFS will receive a data transfer verification notice containing information about the success or failure of the file transfer. Appropriate action will be taken based on this information. The tasks associated with this function (see box 3 in Figure 3) are as follows:

1. Receive confirmation notification.
2. Process confirmation notices and determine appropriate action.
3. Retransmit file on "push" error.

The confirmation notice can be done for "pulled" files through specially coded mail, called receipt confirmation notices (RCN), or can be accomplished for "pushed" files through the automated verification response technique. The RCN mail message will be parsed by an automated process, which looks for the status of the file transfer, and records the results. "Pushed" files will resend buffers not successfully received until file transfer is verified.

4.5 Processed File Management

The SAFS will perform file management on the processed file. This includes error reporting, database updating, status screen updating, and disk administration. The tasks associated with this function (see box 4 in Figure 3) are as follows:

1. Evaluate status information related to processed files.
2. Perform disk administration as needed.
3. Update status files and process errors as needed.

Errors caused by an unidentified file designator or by an unsuccessful file transfer will result in a log entry. An appropriate console display or web page will also be updated to indicate the error. A secondary destination can be utilized for "pushed" files that failed to be successfully delivered to their primary destination. File delivery notices (FDN) will report the destination receiving the file, any delivery failures, as well as the file's source location.

Processed files will only be deleted after a pre-determined retention time (default is 96 hours).

5.0 DESIGN IMPLEMENTATION PROPOSAL

5.1 System Operation

The SAFS systems are autonomous, needing no external direction once they have been installed and configured for specific mission support. The major components of the SAFS system are a server and a RAID drive, which has a separate console for its configuration and diagnostic programs, and status displays. This console has audible warnings whenever a failure is detected, including the loss of the server. The replacement of drives, fans and disk controllers are "hot swappable", meaning their replacement can be performed without taking the RAID drive off line. Hot backup drives can be designated as swappable for a failed drive without loss of data due to the RAID configuration at level 3. This RAID level also requires an additional drive to aid in the reconstruction of the data on the failed drive. It is recommended that an additional spare drives be allocated for every 3 drives in the system as hot swappable in case of multiple disk failure.

While an operational SAFS's processes are automated, errors/failures of external components can inhibit/degrade its performance. Critical among these components are the communication links on which SAFS relies for its performance. SAFS will monitor the performance of data transfers and will alert the WPS link controller whenever degradation is apparent. If communication links or one of the SAFS components are down, then the customer should notice that their data is not being made available and so should also notify the WPS link controller of a problem. At ground station with an automated tracking station master, the SAFS will send a "heart-beat" to indicate it is operational. This will be an automated indicator of the "health" of SAFS, and its non-availability will be reported. Even though SAFS will be unattended, each ground station has support personnel that can help troubleshoot problems. As long as the SAFS components are operational and communication links are up, remote debugging of system problems can also be performed from the WFF SAFS prototype lab. A support contract should also provide support personnel at the Central SAFS to assist in remote debugging efforts, since this system will not be in a ground station environment. (It will be located within range of communication support personnel, but they can only give "feet and fingers" support for maintenance questions.)

5.2 Systems Needed

5.2.1 Lab Prototype for Development

The following figure illustrates the prototype environment simulating the integration of the ground station components, SAFS, and customers representing multiple missions, a variety of available platforms, data transfer protocols, and customer choices for interactions. Two servers need to be procured to represent a ground station SAFS and a Central SAFS in the prototype. One of these can be reused as the WPS ground station SAFS system. The other will stay in the lab after the prototype period to provide operational support as needed.

The following COTS-C products need to be procured for the following prototype platforms: 4 SGI, 1 NT, 1 HP, 1 SUN.

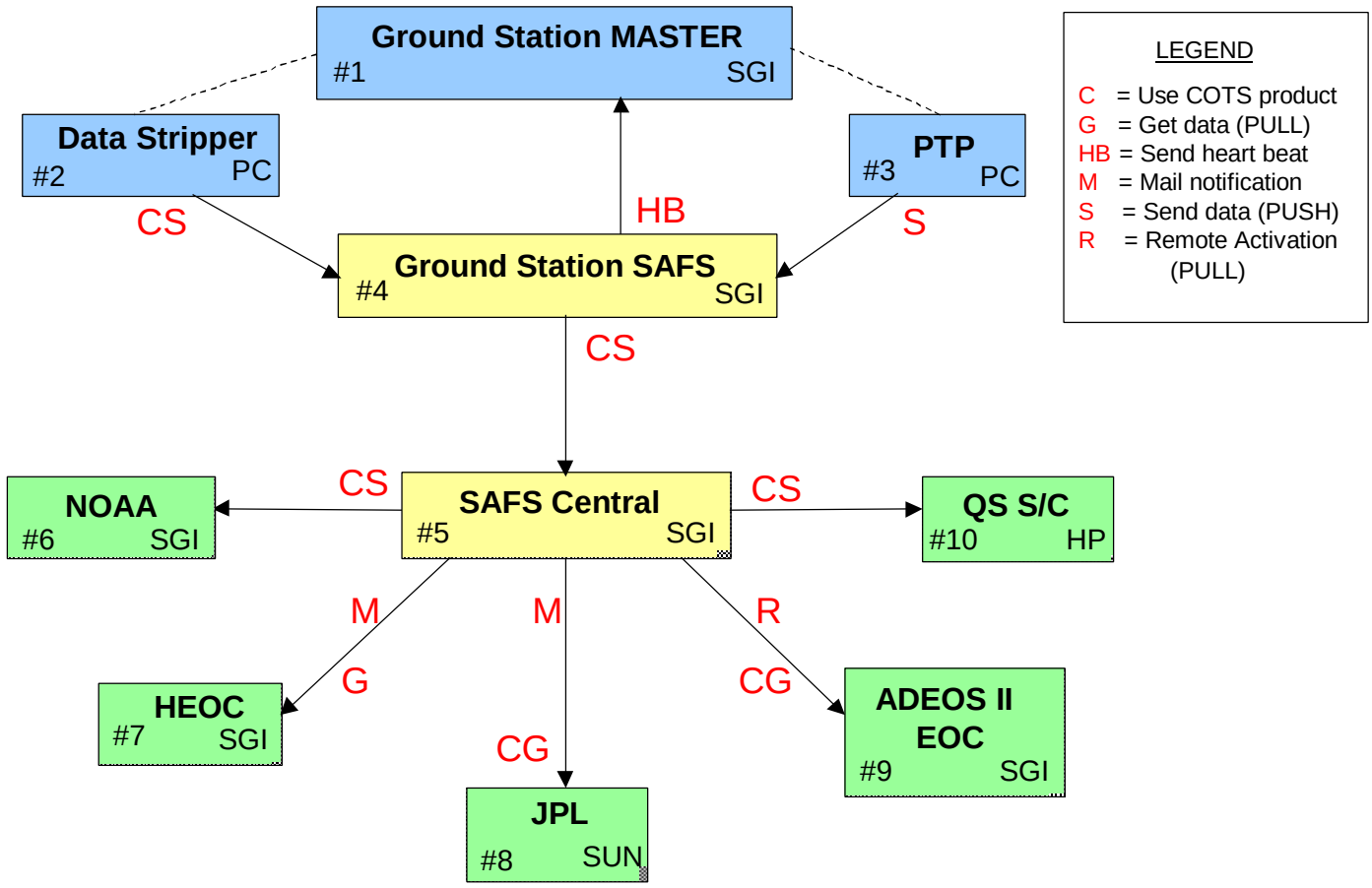

Figure 4 - Lab Prototype Configuration

5.2.2 Operational SAFS Systems

Based on the known mission requirements as detailed in section 3, the following chart represents the summary of the total data volumes anticipated at each operational SAFS site.

Table 5 - Drive Size Requirements

SAFS	QuikSCAT	ADEOS-II	Daily Total	96 Hour Total
WPS	506.8 MB	2946.4 MB	3,453.2 MB	13,812.8 MB
AGS	506.8 MB		506.8 MB	2,027.2 MB
SGS	506.8 MB		506.8 MB	2,027.2 MB
ASF		10,312.4 MB	10,312.4 MB	41,249.6 MB
Central	506.8 MB	13,258.8 MB	14,779.2 MB	59,116.8 MB

Based on this data volume, we are recommending the following drive storage sizes:

WPS	**27 GB** * (3+1+2)	6x9 GB =	**54 GB**	
AGS	**9 GB** * (3+1+2)	6x9 GB =	**54 GB**	(45 GB minimum recommended)
SGS	**9 GB** * (3+1+2)	6x9 GB =	**54 GB**	(45 GB minimum recommended)
ASF	**90 GB** * (10+1+4)	15x9 GB =	**135 GB**	
Central	**126 GB** * (14+1+5)	20x9 GB =	**180 GB**	

*Volume + RAID Level + Hot Backup = Total number of drives

To provide for current and near future mission requirements, the sizes shown above on the left represent a doubling of the original 96 hour totals with a selection of the next higher multiple of 9 GB (minimum RAID disk size). Sizes shown above on the right allow for a RAID level 3 configuration and a hot backup drive per every 3 drives in the system.

For each operational SAFS, the following need to be procured:

1. Rack mounted server
2. Rack mounted RAID drive with the indicated disk capacity for the site.
3. COTS-C product
4. Spare parts
5. Cables
6. Hardware maintenance and software upgrades with technical phone support.

Additional funds should be allocated to cover the cost of installation at each site, including labor and travel.

5.3 Installation Schedule

Tables in Appendix A indicate the proposed schedule for procurements and installations to meet the requirements detailed in section 3. The first table is ordered by date, while the second table represents the same information ordered by site. The procurement must be completed in January 1998 with delivery to the sites in March 1998 in order to have installations completed before the June data flow test.

5.4 Maintenance

Support contracts should also be provided for each SAFS server, RAID drive, and COTS-C maintenance. The hardware support should be global on-site support, 8am-5pm(local time), Monday-Friday, 4-hour/best effort on-site response within support hours, and 24-hour/7 day technical phone support. All support contracts should include technical hardware and software phone support, free hardware replacement and installation of defective parts (time and travel included), and free software upgrades.

5.5 Cost Estimate

Table 6 – Site Cost Estimate

Item	Central	WPS	SGS	AGS	ASF	MGS
Server						
RAID Drive						
Rack						
Software						
Cables						
UPS						
Server Spares						
SCSI converter						
Hard drive						
Transceiver						
RAID Spares						
Drives						
Controller						
Transceivers						
Fans						
Power supply						
Console						
Support contract						
Maintenance						
Software						
Hardware						

Appendix A - Milestones and Schedules

The following functions need to be performed in order to implement an operational SAFS system:

Table 7 - Procurement schedule by date

Nov-97	Dec-97	Jan-98	Feb-98
RAID order	COTS order for SAFS prototype in lab	COTS order	PTP to SGS
- Lab	1 SGI - central/lab	3-6 - ground station SAFS	PTP to AGS
	1 SGI - ground station →	(1 SGI - GSFC)	PTP to WPS
	2 SGI - customer →	(1 SGI - AGS)	
	1 HP - customer	1 SGI - SGS	
	1 NT - data stripper	1 SGI - MGS	
	1 SUN - customer	1 SGI - ASF	
	7 COTS products	(1 SGI - WPS)	
		3-4 - customers	
		(1 SUN - JPL)	
		1 SUN - NOAA	
		1 SUN - S/C (MOC)	
		1 SUN - JPL (Backup MOC)	
		2-4 - ground station data strippers (ADEOS II)	
		2 SUN - WPS (1 primary, 1 backup)	
		2 SUN - ASF (1 primary, 1 backup)	
		8-14 COTS products	
		1/15 - Server/RAID Maintenance order	
		1 SGI - Lab	
		1 SGI - Lab/WPS ground station	
		1 SGI - GSFC	
		1 SGI - AGS	
		1 SGI - SGS	
		1 SGI - ASF	
		1 SGI - MGS	
		7 servers/maintenance	
		1 for SGI - Lab/WPS ground station	
		1 for SGI - GSFC	
		1 for SGI - AGS	
		1 for SGI - SGS	
		1 for SGI - ASF	
		1 for SGI - MGS	
		6 RAID drives/maintenance	

Table 8 – Delivery and installation schedule by date

Mar-98	Apr-98	May-98	Jun-98	Jul-98
3/15 - HW/SW delivery	4/1 - Prototype Data Flow Test	SGS	S/C / HK Data Flow Test	End-to-End Testing
Deliver to ASF		Install - 4/27 - 5/1		
Deliver to AGS		Config/Test - 5/4-8		
Deliver to SGS				
Deliver to WPS	GSFC/AGS/ASF			
Deliver to Lab (server only)	Install - 4/6-10			
Deliver to GSFC	Config/Test - 4/13-17			
Lab/WPS				
Install - 3/16-20				
Config/Test - 3/23-27				
Deliver to MGS - TBD				

Table 9 – Procurement, delivery and installation schedule by site

	LAB	ADEOS D/S	WPS	AGS	GSFC	SGS	ASF	MGS	Customers
RAID Ordered	Oct-97		Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	
RAID Delivered	Nov-97		3/15/98	3/15/98	3/15/98	3/15/98	3/15/98	3/15/98	
Server Ordered	Jan-98		Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	
Server Delivered	3/15/98		3/15/98	3/15/98	3/15/98	3/15/98	3/15/98	3/15/98	
COTS Ordered	Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	Jan-98	Jan-98
COTS Delivered	Feb-98	Feb-98	Feb-98	Feb-98	Feb-98	Feb-98	Feb-98	Feb-98	Feb-98
System Integration/installation	3/16-20/98	Feb-98	3/16-20/98	4/6-10/98	4/6-10/98	4/27-5/1/98	4/6-10/98	??	Feb/Mar-98
PTP installation			Feb-98	Feb-98		Feb-98		??	
D/S installation (ADEOS II)			Aug-98				Nov-98	??	
Testing	3/23-27/98	Feb/Mar-98	3/23-27/98	4/13-17/98	4/13-17/98	5/4-8/98	Feb-99	??	4/98,6/98,7/98

Appendix B - Applicable Documents

Data Distribution Facility (DDF) Data Distribution System (DDS) Consumer System Users Guide	CSC 100318211
ADEOS-II Network Communications Interface Control Document	EOIS.AII-ND-009
ADEOS-II Network Communications Interface Requirements Document	EOIS.AII-ND-008
ADEOS-II Ground System Interface Requirements Document	AD2-EOC-96-056
The ADEOS-II Project Ground Segment: GLI-1Km L0 Format	AD2-EOSD-97-011
The ADEOS-II Project Ground Segment: HK TLM Format	AD2-EOSD-97-012
The ADEOS-II Project Ground Segment: ARGOS DCS L0 Format	AD2-EOC-97-44
The ADEOS-II Project Ground Segment: ILAS-II L0 Format	AD2-EOC-96-121
The ADEOS-II Project Ground Segment: AMSR L0 Format	AD2-EOC-96-122
The ADEOS-II to Ground Station Interface Document	AD2-EOC-96-123
ADEOS-II Mission Operations Interface Specification: NGN	AD2-EOC-97-046
ADEOS-II Mission Operations Interface Specification: Common Part	AD2-EOC-96-054
ADEOS-II Mission Operations Implementation Plan	AD2-EOC-96-055
SAFS Project Management Plan	Version 1.1
QuikSCAT Mission Requirements Request	Version 1.0
Request for Quote: Performance specification for QuikSCAT	9/5/97
Request for Quote: Statement of Work for QuikSCAT	*9/5/97*
QuikSCAT Ground System Interface Control Document (Draft)	*12/16/97*
QuikSCAT Mission Operations Integrated Test Plan (Draft)	*12/97*

Appendix C - Abbreviations and Acronyms

The following alphabetized list contains the definitions of the abbreviations and acronyms that may be used in this document:

ADEOS	Advanced Earth Observing Satellite
AGS	Alaska Ground Station
AMSR	Advanced Microwave Scanning Radiometer
ASF	Alaska SAR Facility
COTS	Commercial Off the Shelf
COTS-C	COTS Communications product
DCS	Data Collection System
DRN	Data Ready Notification
D/S	Data Stripper
FDN	File Delivery Notice
FTP	File Transfer Protocol
GB	GigaByte
GLI-1km	GLobal Imager System 1-km resolution
GSFC	Goddard Space Flight Center
HK	Housekeeping data
ILAS-II	Improved Limb Atmospheric Spectrometer
MB	MegaByte
Mbps	MegaBits per second
MFTP	Multicast FTP
MGS	McMurdo Ground Station
MOC	Mission Operations Center
NASA	National Aeronautics and Space Administration
NGN	NASA Ground Network
NISN	NASA Integrated Services Network
NOAA	National Oceanographic and Atmospheric Administration
PTP	Programmable Telemetry Processor
QuikSCAT	NASA Quick Scatterometer Mission
RAID	Redundant Array of Indepent Disks
RCN	Receipt Confirmation Notification
R/T	Real Time
SAFS	Standard Autonomous File Server
S/C	Spacecraft
SCI	Science data
SGS	Svalbard Ground Station
SW	SeaWinds
TBD	To be determined
WPS	Wallops Ground Station
WFF	Wallops Flight Facility